

## **Historic, Archive Document**

Do not assume content reflects current scientific knowledge, policies, or practices.



A 464101  
F 76

UNITED STATES DEPARTMENT OF AGRICULTURE

# FOREST SERVICE

X ANNUAL REPORT

ON

THE CONTROL OF WHITE PINE BLISTER RUST

IN CALIFORNIA

FOR THE CALENDAR YEAR 1964 X

U. S. FOREST SERVICE  
NATIONAL ARCHIVES LIBRARY

MAR 28 1965

CURRENT SERIAL RECORDS



U. S. DEPARTMENT OF AGRICULTURE  
FOREST SERVICE  
CALIFORNIA REGION  
1964



## BLISTER RUST CONTROL IN CALIFORNIA - 1964

The white pine blister rust control program in California has three inter-related objectives: (1) indirect control of the disease by means of ribes suppression, (2) direct control through sanitation pruning, and the use of chemical fungicides applied directly to infected trees, and (3) the development of rust-resistant sugar pine planting stock.

At the present time, selected stands of white pines in California are protected principally through the suppression of ribes populations. These plants, which are alternate hosts for the disease, are eradicated mainly by hand grubbing, and most of the work is performed under contract. A small amount of eradication is done in light ribes populations by hired technicians. A variety of operational surveys are conducted both under contract and by seasonal employees.

### BLISTER RUST CONTROL IS A COOPERATIVE UNDERTAKING

The control of white pine blister rust in California involves the cooperation of several State and Federal agencies as well as numerous representatives of California's forest industry. The cooperators and their principal roles in the program are:

THE STATE OF CALIFORNIA Through its continued interest and substantial financial support, the State of California makes possible the protection of sugar pine stands on approximately 170,000 acres of privately-owned forest land. Control work is financed jointly; the contribution of private owners, plus the Federal appropriation, is matched by the State.

If the owner does not contribute financially, but agrees to manage the stand for sugar pine production, the State and Federal Government share the cost of protection.

Control operations on State and private lands are carried out by the Forest Service under a cooperative agreement with the State of California. Eight National Forests perform the work with technical assistance and coordination from the Regional Office of the Forest Service in San Francisco and from the California Division of Forestry.

Some ribes eradication on State and privately-owned lands is done by crews from State Conservation Camps as a part of the State Cooperative Project. About 12,000 acres of State Forests and Parks are included in protection units; here the work is financed entirely by the State. The University of California, which manages the Blodgett Experimental Forest, is also an active participant in the program. Control accomplishments on State and private lands are reported in the accompanying tables under the heading: "Work Done by the State Cooperative Project."



INDUSTRY Individual forest landowners in California may participate directly by entering cooperative agreements with the Forest Service and the State of California. They are encouraged to contribute up to 25 percent of the cost of control.

California's forest industry participates indirectly through the California Forest Pest Action Council which periodically reviews progress of the blister rust control program and makes appropriate recommendations to the State Board of Forestry.

NATIONAL PARK SERVICE The National Park Service has selected for protection outstanding stands of white pines throughout the National Parks in California. At the present time these units, in which five species of white pines are represented, comprise 160,000 acres. Control work is done by the National Park Service with the technical assistance of the Forest Service.

FOREST SERVICE The Forest Service is responsible for leadership, technical direction, and the coordination of control work on lands of all ownerships. This service is provided by the Division of Timber Management of the Regional Office in San Francisco. In addition, ten National Forests have active sugar pine management programs. At present, National Forest sugar pine management units include 290,000 acres.

The field operations needed to carry out the State Cooperative Project and National Forest Project are identical and frequently involve intermingled lands. For this reason, the two projects are conducted as a single integrated operation by individual National Forests.

#### THE RIBES ERADICATION PROGRAM IN 1964

In 1964, ribes were eradicated from more than 22,000 acres of Federal and privately-owned land. Only a minor amount of work was required on State land. Over 16,000 acres of this ribes eradication was done by contractors at an average price of \$7.24 per acre.

#### SUCCESSFUL INMATE PROJECT

The California Division of Forestry, District 2, conducted a highly successful eradication project in which inmates from the Intermountain, Magalia, and Antelope Conservation Camps performed initial and reeradication on 1,080 acres of privately-owned lands adjacent to the Lassen National Forest. The project will continue at about the same level for the next three years.

#### WORK ON NATIONAL PARKS

Work in many control units of the Lassen Volcanic National Park is on a long-term maintenance basis and will require very little further

attention. The field work of delineating stands of white pines was completed in 1964 and an appraisal will determine the need for changes in the protection unit boundaries.

All sugar pine stands within control units in Yosemite National Park are rapidly approaching a maintenance status. In 1964, 4,053 acres were added to maintenance, bringing the total to 75,614 acres. To date, 90 percent of the total protected sugar pine acreage in the Park has been placed on maintenance status. All eradication was done by skilled technicians who also worked on ribes surveys. Due to the small amount of eradication needed, the Park has had no ribes eradication contracts since 1961.

#### AMOUNT OF REINSPECTION REDUCED

Revised, less stringent ribes eradication standards were used throughout the California Region in 1964. Contract procedures also were revised to include a charge for the second inspection (previously free) and to bring all reinspection charges in line with present operating costs. When the change was made, it was expected that these revisions would have the effect of reducing the amount of reinspection required, but that higher bid prices would result. As it developed, a higher proportion of the contract acreage did meet work standards on the first inspection than in previous years, (resulting in a corresponding saving in inspection costs), but bid prices remained substantially the same; in fact they were slightly lower than in 1963.

#### RIBES SURVEYS ARE CONTRACTED

In 1962 and 1963 a small amount of ribes survey work was contracted on the Lassen National Forest on an experimental basis. This survey method was used in 1964 by five of the six National Forests with active ribes survey programs. Most of the contractors were consulting foresters or were experienced in ribes surveys or other survey work. Each bidder was prequalified before his bid was accepted. Only advance and post checks were contracted.

Accomplishments and costs of the contract program in 1964 are summarized below:

| <u>National Forest</u> | <u>Strip Acres<br/>Of Survey<sup>1/</sup></u> | <u>Average Cost<br/>Per Strip Acre<sup>2/</sup></u> |
|------------------------|-----------------------------------------------|-----------------------------------------------------|
| Shasta-Trinity         | 179.1                                         | \$23.85                                             |
| Lassen                 | 407.0                                         | 13.63                                               |
| Tahoe                  | 395.0                                         | 19.29                                               |
| Eldorado               | 43.0                                          | 21.07                                               |
| Stanislaus             | 39.5                                          | 27.66                                               |
| Total                  | 1,063.6                                       | Regional Av. (\$18.29)                              |

<sup>1/</sup> Two strip acres equal one mile.

<sup>2/</sup> These costs include the cost of required control lines as well as sample strips.



Bid prices in 1964 were higher than anticipated, but are expected to drop as competition develops between bidders. The average bid price on the Lassen National Forest, where ribes surveys had been contracted before, and where experienced bidders were available, is thought to be more representative of the cost level that can be attained than is the Regional average. However, the average cost of \$18.29 per strip acre is close to survey costs on three other National Forests where some or all of the survey work was done with Forest Service technicians.

On the Lassen and Tahoe National Forests, where a substantial contract survey program was undertaken, and where almost the entire advance and post check program was done by contract, the number of seasonal technicians was reduced to one-third of the number that would have been needed otherwise.

### THE DIRECT CONTROL PROGRAM IN 1964

At present, with the exception of the fungicide testing project, direct control plays a minor part in California's blister rust control project. In 1964, aside from a small amount of canker pruning on the Plumas National Forest, all control work was by means of ribes eradication.

### FUNGICIDE TESTING ON SUGAR PINE

> The testing of fungicides for the direct treatment of blister rust on sugar pine has been underway in California since 1957. With the reading and analysis of plot data in 1964, an important milestone in the program has been reached. This occasion provides an appropriate opportunity to outline the course of this project in California, to summarize results to date, and to indicate the future of the fungicide testing program in California. Following is a brief resume of fungicide testing on sugar pine with particular reference to California. Four units of the Forest Service have been involved in this program: the California Region (Region 5), the Pacific Northwest Region (Region 6), the Pacific Southwest Forest and Range Experiment Station (PSW Station), and the Pacific Northwest Forest and Range Experiment Station (PNW Station).

EARLY TESTS Experimental use of antibiotics for the treatment of tree diseases began in the early 1950's, and by the mid 1950's, Actidione and other fungicides had been tested on western white pine in Idaho by Region 1 of the Forest Service. (Antibiotics are fungicides that can be produced only by living organisms, such as mold fungi.) Initial results of those tests were promising, and Actidione was used operationally in Region 1 by 1958.

1957 - FIRST TEST IN CALIFORNIA In the fall of 1957, Region 5 began limited-scale testing of the procedures and materials recommended by Region 1. The first tests were made in the Shasta-Trinity National



Forest, and these were followed by additional tests at the same location in 1958. Both these tests were of the direct treatment method employing quite low concentrations of Actidione in kerosene.

1959 - FURTHER REGION 5 TESTS During the winter of 1958-1959, Region 5 and the PSW Station initiated a cooperative testing program. Both antibiotics and conventional fungicides were included in the tests. The testing program, which has remained continuously active to the present, has been carried out by the Klamath National Forest under the direction of Dr. Wendell W. Showalter with technical assistance from C. R. Quick of the PSW Station, and administrative assistance from Region 5.

1959 - PSW STATION TESTS At this time, the PSW Station also began a series of fungicide tests, under the direction of C. R. Quick, that were intended both to complement those of the Klamath National Forest, and to screen new fungicides, diluents, and additives for possible further testing. To a marked degree the Region 5 and PSW tests were part of a single, coordinated program involving close cooperation between the two units.

1959 - REGION 6 TESTS From 1959 to the present, testing and pilot study work has been done on both sugar pine and western white pine by the Forest Service and the Bureau of Land Management in Oregon and Washington. 

1961 - INTERREGIONAL TEST Following a review of fungicide testing progress by Regions 5 and 6 and the PSW and PNW Stations in the winter of 1960, an interregional test of the two antibiotics, Actidione and Phytoactin was undertaken. Field work for this test, under the direction of George Harvey of the PNW Station, was performed in the summer of 1961 and 1962.

1964 - REVISED REGION 5 TEST From the beginning, a basic difficulty in fungicide testing has been the extended period that is required between the treatment and a reliable reading of the effects. The 1963 reading of the Region 5 tests provided the first information of sufficient volume and reliability to justify tentative conclusions. (Reliable negative readings are, of course, available much sooner than reliable positive ones. In the case of the earliest tests in 1957 and 1958, the results were largely negative, and the tests were discontinued early in the program.)

Analysis of data from the 1963 reading (chiefly from the 1959 and 1960 tests) indicated that a more systematic and methodical test of a few of the more promising materials was needed. Accordingly, the study plan was revised and a new test was established in the summer of 1964.

#### RESULTS OF REGION 5 TESTS

The results of the principal tests made by Region 5 (as distinct from those made by the PSW Station) are summarized in tables A, B, and C.

OBJECTIVE OF TESTS These tests were undertaken primarily to determine if certain fungicides at specific concentrations were sufficiently effective to justify operational use. With the exception of a few conventional fungicides tested in 1959, all materials had been screened earlier by the PSW Station or by Region 1. The tests were not designed to study the many variables involved in fungicide treatment, or to correlate treatment success or failure with any of them. Consequently, some of the customary features of forest research such as controls and replications, were omitted. Such features were incorporated in the test established in 1964. Most of the applications were by the basal-stem method, the success of which (except for cankers that happen to be located in the treated portion of the bole) depends entirely on translocation of the fungicide from the point of application to the blister rust canker.

Within the scope of these objectives and restrictions, the tests have been entirely successful. They provided a clear answer to the primary question of whether the tested fungicides were effective when applied as a basal-stem application. In addition, they have yielded information that will be useful in further testing and development work. Unfortunately, but not unexpectedly, the tests did not provide answers to many vexing problems, and, in fact, raised many more questions than were answered.

RATING OF TREATMENT RESULTS The rating of treatment results was expressed in terms of the 5-point scale shown below:

SCALE FOR RATING THE EFFECT OF FUNGICIDE TREATMENT

| Canker Rating Class | Effect Of Treatment                                        |
|---------------------|------------------------------------------------------------|
| 1                   | No visible effect                                          |
| 2                   | Slight effect                                              |
| 3                   | Intermediate between ratings 2 and 4                       |
| 4                   | Apparently a pronounced effect                             |
| 5                   | No visible indication that the blister rust is still alive |

Early in the testing program it became apparent that much greater reliability could be assigned to the numerically lower ratings than to the higher ones. In other words, a canker that is fruiting abundantly two years after treatment has definitely not been affected, whereas one that is not fruiting may only be presumed to have been affected to some undetermined degree.



Table A is intended to summarize only those conclusions in which reasonable confidence can be placed. Consequently, only the extremes of the rating scale are given, and the entries in columns 3 and 6 correspond to rating classes 1, 2, and 3, while columns 4 and 7 correspond to rating class 5. Rating class 4 is not represented in the table. This abridgement is illustrated by table B which gives an expanded picture of the results of line 1 of table A; here the actual number and the percent of cankers in each rating class is given.

CONCLUSIONS The 1964 readings of the Region 5 tests support the following general conclusions:

1. No fungicide tested appears sufficiently effective to justify operational use.

Results in the "apparently dead" column should be interpreted with caution. Many untreated cankers on untreated sugar pines (particularly older cankers on larger trees) have an appearance that would justify a rating of 4 or 5. Also, it is known that all cankers do not sporulate every year. It is not known how long a canker must remain "apparently dead" before it can be classified as definitely dead. At present, it is thought that five growing seasons following treatment are required before reliable positive readings are possible. On the other hand, some of the cankers rated 4 will undoubtedly later become 5's.

This conclusion, however, is based chiefly on the results in columns 3 and 6, where the readings are felt to be quite reliable at present, and the conclusion could be restated in the following way: the percentage of cankers that remain alive three or more years after treatment is too high to justify operational application.

2. Both of the antibiotics and several of the conventional fungicides unquestionably have had an effect on treated cankers.

In this connection, the results of the more promising materials, lines 1-5 of table A should be compared with the results of those materials, line 6, that were so ineffective that they have been dropped from the testing program. The test results shown in line 6, columns 5, 6, and 7, where cankers were not directly sprayed may be considered controls against which the other tests may be measured; that is, it may be supposed that untreated trees would have yielded readings at least numerically equal or higher than these.

The number and percent of cankers in each rating class for line 6, unsprayed cankers, is given in table C.

3. The fungicides tested are much more effective when applied directly to the canker than when applied at a distant location. Perhaps this shows that there is little evidence of translocation.

Table A  
Results Of Fungicide Testing  
For The Control Of White Pine Blister Rust  
On Sugar Pine In California  
(Region 5 Tests Only)

| Fungicide                               | Sprayed Cankers                    |                          |                                    | Unsprayed Cankers                  |                          |                                    |
|-----------------------------------------|------------------------------------|--------------------------|------------------------------------|------------------------------------|--------------------------|------------------------------------|
|                                         | Number<br>Of<br>Cankers<br>Treated | % Of Cankers             |                                    | Number<br>Of<br>Cankers<br>Treated | % Of Cankers             |                                    |
|                                         |                                    | Defin-<br>itely<br>Alive | Appar-<br>ently<br>Dead In<br>1964 |                                    | Defin-<br>itely<br>Alive | Appar-<br>ently<br>Dead In<br>1964 |
| 1                                       | 2                                  | 3                        | 4                                  | 5                                  | 6                        | 7                                  |
| 1 Actidione                             | 207                                | 29                       | 18                                 | 409                                | 50                       | 10                                 |
| 2 Phytoactin,<br>Basal Stem             | 38                                 | 40                       | 21                                 | 83                                 | 58                       | 12                                 |
| 3 Phytoactin,<br>Aerial<br>Application  | -                                  | -                        | -                                  | 109                                | 51                       | 9                                  |
| 4 Dowicide I                            | 21                                 | 29                       | 52                                 | 35                                 | 46                       | 6                                  |
| 5 Terraclor                             | 43                                 | 44                       | 19                                 | 71                                 | 39                       | 18                                 |
| 6 Other Con-<br>ventional<br>Fungicides | 30                                 | 57                       | 10                                 | 115                                | 79                       | 2                                  |

Note: Fungicides were applied to 952 test trees during the period 1959-1961. Except for the other conventional fungicides, line 6, which were dropped from the program following the 1962 reading, all results are as of 1964. Except for some western white pines included in the aerial test of Phytoactin, line 3, all test trees are young-growth sugar pines. All cankers are bole cankers.

Table B  
Actidione, Sprayed Cankers Only

| Canker Rating Class | 1  | 2 | 3  | 4   | 5  | Total |
|---------------------|----|---|----|-----|----|-------|
| Number Of Cankers   | 25 | 4 | 32 | 109 | 37 | 207   |
| Percent Of Cankers  | 12 | 2 | 15 | 53  | 18 | 100   |

Table C  
Other Conventional Fungicides,  
Unsprayed Cankers Only

| Canker Rating Class | 1  | 2 | 3  | 4  | 5 | Total |
|---------------------|----|---|----|----|---|-------|
| Number Of Cankers   | 58 | 8 | 25 | 22 | 2 | 115   |
| Percent Of Cankers  | 50 | 7 | 22 | 19 | 2 | 100   |



## FUNGICIDE TESTING IN THE FUTURE

During the winter of 1964-1965 a second progress conference on fungicide testing was held. At this meeting fairly reliable information from tests of both Regions, both Stations, and the Bureau of Land Management in Oregon was discussed fully. The conclusions following this discussion were:

1. Not enough evidence of control has been demonstrated to warrant operational use of either the antibiotic or conventional fungicides.
2. Tests already established should continue to be evaluated.
3. The work done to date offered sufficient promise to justify continuation of the testing program.
4. Further tests should include conventional fungicides.
5. Further testing should be carried out jointly by both Regions and Stations.

At the same time, a four-man Steering Committee of representatives from both Regions and both Stations was created to recommend a specific testing program. The recommendation is now being prepared. Both the California Region and the PSW Station will continue to read previously established tests until conclusive readings are obtained. The Region will establish no new tests that are independent of the inter-regional program. The PSW Station will continue to screen promising materials.

### THE RUST-RESISTANT SUGAR PINE PROJECT IN 1964

The rust-resistant sugar pine project, which started in 1957, continued as a part of the Region's forest tree improvement program. Approximately 100 rust-resistant candidates have been located. Several of these candidates have been subsequently abandoned. In addition, three candidates were killed by bark beetles in 1964. Grafts of these trees are represented in the archives plantations. No additional searching for rust-resistant candidates was done during 1964.

## RELEASE AND FERTILIZATION OF CANDIDATES

The ten candidates released in 1963 by the removal of all vegetation from a 66-foot circle around the trees were fertilized in 1964. The fertilizer mixture was put in drilled four-inch holes in a zigzag pattern around the drip line of each tree. These trees are a part of a female-flower-stimulation study.

## CROSS POLLINATION OF CANDIDATES

During the 1964 pollination season, 61 candidates were inspected for pollen-bearing flowers. Pollen production was poor since only 15 of the candidates produced pollen in collectible quantities. The pollination phase of the program consisted of 115 successful pollinations producing 145 conelets. This number includes 63 cross

pollinations.

### GRAFTING

Fall grafting of scion wood from rust-resistant candidates was continued with a total of 267 grafts of which 54 percent were successful. The grafting of scion wood from all present candidates is now complete.

### OUTPLANTING

In 1964, outplantings of an additional 105 potted grafts were established at the Badger Hill archives plot on the Eldorado National Forest. Also, in 1964, the following plantings were made at the Happy Camp testing site on the Klamath National Forest: (1) 104 potted grafts from candidate trees, (2) 100 seedlings from sp x (sp x armandi) backcrosses, and (3) 1,024 cross pollinated progeny and controls.

### PROGENY TESTING

Both the 1962 and 1963 artificial inoculation tests of rust-resistant sugar pine progenies have shown poor results. This lack of infection on controls as well as test progeny could be due to improper techniques, poor inoculum, or lack of light in the inoculation chamber. Artificial inoculation tests have been temporarily discontinued. In contrast, the field testing at Happy Camp outplanting was quite successful.

### RUST SPREAD AND INTENSIFICATION IN 1964

White pine blister rust on ribes was scarce in the southern portion of its range, but was more prevalent in the favorable sites in the northern part of the State. Enough rain fell at some of the northern infection centers around the first of September to cause some intensification of the rust on ribes. The next rain occurred during the last few days of October, but by that time most of the rusted leaves had dropped, greatly reducing the chances of pine infection.

Detection surveys in the northern part of the State still showed that 1959 was the last year of any appreciable return of the rust from ribes to pine, but that cankers of 1958 origin are much more numerous. No extension of the known range of blister rust in the Sierra Nevada was reported in 1964 so that Dodge Ridge on the northern end of the Stanislaus National Forest remains the point of southernmost penetration.



TABLE 1

STATUS OF RIBES ERADICATION IN CALIFORNIA AS OF DECEMBER 31, 1964

| Ownership                                  | Control Operation                                         | Control Units |                | Status of Ribes Eradication |         |             |                 |
|--------------------------------------------|-----------------------------------------------------------|---------------|----------------|-----------------------------|---------|-------------|-----------------|
|                                            |                                                           | Total Acres   | Acres Unworked | Net Acres by Workings       |         |             | Acres on Maint. |
|                                            |                                                           |               |                | Initial                     | Reerad. | Maint. Work |                 |
| WORK DONE BY THE STATE COOPERATIVE PROJECT |                                                           |               |                |                             |         |             |                 |
| PRIVATE LAND                               | Mendocino<br>(Glenn County)                               |               |                |                             |         |             |                 |
|                                            | Klamath<br>(Siskiyou County)                              | 2,300         |                | 2,300                       | 3,974   | 2,449       | 2,300           |
|                                            | Shasta-Trinity<br>(Siskiyou and Shasta Counties)          | 4,321         |                | 4,321                       | 6,849   |             | 221             |
|                                            | Modoc<br>(Siskiyou and Modoc Counties)                    | 8,489         | 654            | 7,835                       | 1,263   |             | 917             |
|                                            | Lassen<br>(Tehama, Butte, Plumas,<br>and Shasta Counties) | 65,417        | 4,039          | 61,378                      | 72,693  | 5,882       | 35,019          |
|                                            | Plumas<br>(Plumas, Butte, Yuba,<br>and Sierra Counties)   | 23,284        | 1,792          | 21,492                      | 47,160  |             | 1,860           |
|                                            | Tahoe<br>(Sierra, Nevada, and<br>Placer Counties)         | 1,585         |                | 1,585                       | 1,699   | 6           | 533             |
|                                            | Eldorado<br>(Eldorado, Placer, and<br>Amador Counties)    | 41,783        | 7,631          | 34,152                      | 70,831  | 338         | 8,320           |
|                                            | Stanislaus<br>(Calaveras and Tuolumne Counties)           | 8,112         | 316            | 7,796                       | 20,791  | 155         | 4,181           |
|                                            | Sierra *<br>(Mariposa, Madera,<br>and Fresno Counties)    | 14,422        | 1,285          | 13,137                      | 12,009  | 66          | 620             |
|                                            | TOTAL                                                     | 169,713       | 15,717         | 153,996                     | 237,269 | 8,896       | 53,971          |
| STATE LAND                                 | Latour State Forest                                       | 3,109         | 132            | 2,977                       | 2,027   | 53          | 1,732           |
|                                            | Blodgett Forest-Univ. of Calif.                           | 940           |                | 940                         | 2,859   |             |                 |
|                                            | D. L. Bliss-Emerald Bay State Parks                       | 2,280         |                | 2,280                       | 89      |             | 1,203           |
|                                            | Calaveras Big Trees State Park                            | 5,073         | 814            | 4,259                       | 10,230  |             | 3,061           |
|                                            | Mountain Home State Forest*                               | 878           | 130            | 748                         | 395     |             |                 |
|                                            | TOTAL                                                     | 12,280        | 1,076          | 11,204                      | 15,600  | 53          | 5,996           |
| TOTAL STATE AND PRIVATE                    |                                                           | 181,993       | 16,793         | 165,200                     | 252,869 | 8,949       | 59,967          |
| WORK DONE BY THE FOREST SERVICE            |                                                           |               |                |                             |         |             |                 |
| NATIONAL FOREST LAND                       | Mendocino                                                 | 8,521         | 6,911          | 1,610                       | 1,105   |             |                 |
|                                            | Klamath                                                   | 2,238         |                | 2,238                       | 2,326   | 803         | 2,238           |
|                                            | Shasta-Trinity                                            | 13,696        | 738            | 12,958                      | 8,497   |             | 744             |
|                                            | Modoc                                                     |               |                |                             |         |             |                 |
|                                            | Lassen                                                    | 39,356        | 11,523         | 27,833                      | 17,276  | 1,031       | 9,044           |
|                                            | Plumas                                                    | 71,167        | 16,090         | 55,077                      | 76,917  |             | 4,190           |
|                                            | Tahoe                                                     | 23,286        | 2,248          | 21,038                      | 20,455  | 529         | 4,803           |
|                                            | Eldorado                                                  | 37,319        | 8,423          | 28,896                      | 45,194  | 124         | 5,506           |
|                                            | Stanislaus                                                | 43,965        | 1,272          | 42,693                      | 100,792 | 1,630       | 25,457          |
|                                            | Sierra *                                                  | 49,578        | 19,293         | 30,285                      | 44,415  | 51          | 500             |
|                                            | Sequoia *                                                 | 4,974         |                | 4,974                       | 3,609   |             | 560             |
|                                            | TOTAL                                                     | 294,100       | 66,498         | 227,602                     | 320,586 | 4,168       | 53,042          |
| WORK DONE BY THE NATIONAL PARK SERVICE     |                                                           |               |                |                             |         |             |                 |
| NATIONAL PARK LAND                         | Lassen Volcanic                                           | 27,313        | 1,089          | 26,224                      | 28,880  | 4,392       | 23,720          |
|                                            | Yosemite                                                  | 83,952        | 2,287          | 81,665                      | 111,358 | 15,377      | 75,614          |
|                                            | Sequoia-Kings Canyon *                                    | 50,576        | 2,400          | 48,176                      | 59,661  | 8,322       | 42,667          |
|                                            | TOTAL                                                     | 161,841       | 5,776          | 156,065                     | 199,899 | 28,091      | 142,001         |
| ALL WORK DONE IN CALIFORNIA                |                                                           |               |                |                             |         |             |                 |
| ALL CONTROL OPERATIONS                     |                                                           | 637,934       | 89,067         | 548,867                     | 773,354 | 41,208      | 255,010         |

\*Inactive control operations. Data are as of December 31, 1960.





TABLE 2

## SUMMARY OF RIBES ERADICATION IN CALIFORNIA - 1964

| Ownership                                            | Control Operation                                         | Acres<br>Worked | Eradication<br>Man<br>Days | Thousands<br>of Ribes<br>Destroyed | Acres<br>Surveyed | Contract Eradication |                                                       |         |
|------------------------------------------------------|-----------------------------------------------------------|-----------------|----------------------------|------------------------------------|-------------------|----------------------|-------------------------------------------------------|---------|
|                                                      |                                                           |                 |                            |                                    |                   | Acres<br>Worked      | Average<br>Price<br>Per Acre<br>Paid to<br>Contractor |         |
| WORK DONE BY STATE COOPERATIVE PROJECT               |                                                           |                 |                            |                                    |                   |                      |                                                       |         |
| PRIVATE<br>LAND                                      | Klamath<br>(Siskiyou County)                              |                 |                            |                                    | 155               |                      |                                                       |         |
|                                                      | Shasta-Trinity<br>(Siskiyou and Shasta Counties)          | 320             | 171                        | 4                                  | 745               | 301                  | \$ 5.72                                               |         |
|                                                      | Modoc<br>(Siskiyou and Modoc Counties)                    | 330             | 884                        | 20                                 | 330               |                      |                                                       |         |
|                                                      | Lassen<br>(Tehama, Butte, Plumas,<br>and Shasta Counties) | 3,811           | 1,291                      | 192                                | 18,433            | 3,061                | 5.17                                                  |         |
|                                                      | Plumas<br>(Plumas, Butte, Yuba,<br>and Sierra Counties)   | 2,539           | 840                        | 254                                | 4,534             | 1,482                | 10.96                                                 |         |
|                                                      | Tahoe<br>(Sierra, Nevada, and<br>Placer Counties)         | 160             | 45                         | 12                                 | 1,295             | 160                  | 7.17                                                  |         |
|                                                      | Eldorado<br>(Eldorado, Placer, and<br>Amador Counties)    | 977             | 176                        | 37                                 | 6,509             | 481                  | 4.96                                                  |         |
|                                                      | Stanislaus<br>(Calaveras and Tuolumne Counties)           | 724             | 116                        | 23                                 | 1,664             | 660                  | 4.60                                                  |         |
|                                                      | Sierra*<br>(Mariposa, Madera,<br>and Fresno Counties)     |                 |                            |                                    |                   |                      |                                                       |         |
| STATE<br>LAND                                        | Latour State Forest                                       | 54              | 7                          | 1                                  | 54                | 54                   | 4.60                                                  |         |
|                                                      | Blodgett Forest-Univ. of Calif.                           |                 |                            |                                    |                   |                      |                                                       |         |
|                                                      | D. L. Bliss-Emerald Bay State Parks                       |                 |                            |                                    |                   |                      |                                                       |         |
|                                                      | Calaveras Big Trees State Park                            |                 |                            |                                    |                   |                      |                                                       |         |
|                                                      | Mountain Home State Forest*                               |                 |                            |                                    |                   |                      |                                                       |         |
| ALL WORK DONE<br>BY THE<br>STATE COOPERATIVE PROJECT |                                                           | Initial         | 1,655                      | 1,900                              | 221               | 33,719               | 6,199                                                 | \$ 6.56 |
|                                                      |                                                           | Reeradication   | 5,917                      | 1,548                              | 312               |                      |                                                       |         |
|                                                      |                                                           | Maintenance     | 1,343                      | 82                                 | 10                |                      |                                                       |         |
|                                                      |                                                           | All             | 8,915                      | 3,530                              | 543               |                      |                                                       |         |
| WORK DONE BY THE FOREST SERVICE                      |                                                           |                 |                            |                                    |                   |                      |                                                       |         |
| NATIONAL<br>FOREST<br>LAND                           | Mendocino                                                 | 50              | 75                         | 66                                 | 56                | 50                   | \$30.00                                               |         |
|                                                      | Klamath                                                   |                 |                            |                                    |                   |                      |                                                       |         |
|                                                      | Shasta-Trinity                                            | 555             | 242                        | 7                                  | 5,104             | 475                  | 3.86                                                  |         |
|                                                      | Modoc                                                     |                 |                            |                                    |                   |                      |                                                       |         |
|                                                      | Lassen                                                    | 1,627           | 479                        | 65                                 | 11,876            | 1,627                | 8.03                                                  |         |
|                                                      | Plumas                                                    | 5,417           | 1,955                      | 315                                | 22,668            | 3,820                | 10.07                                                 |         |
|                                                      | Tahoe                                                     | 1,788           | 494                        | 89                                 | 10,325            | 1,788                | 5.63                                                  |         |
|                                                      | Eldorado                                                  | 883             | 201                        | 77                                 | 2,663             | 677                  | 5.51                                                  |         |
|                                                      | Stanislaus                                                | 2,052           | 354                        | 246                                | 6,229             | 1,942                | 5.45                                                  |         |
|                                                      | Sierra*                                                   |                 |                            |                                    |                   |                      |                                                       |         |
| ALL WORK DONE<br>BY THE<br>FOREST SERVICE            |                                                           | Initial         | 2,597                      | 1,119                              | 266               | 58,921               | 10,379                                                | \$ 7.63 |
|                                                      |                                                           | Reeradication   | 9,170                      | 2,608                              | 592               |                      |                                                       |         |
|                                                      |                                                           | Maintenance     | 605                        | 73                                 | 7                 |                      |                                                       |         |
|                                                      |                                                           | All             | 12,372                     | 3,800                              | 865               |                      |                                                       |         |
| WORK DONE BY THE NATIONAL PARK SERVICE               |                                                           |                 |                            |                                    |                   |                      |                                                       |         |
| NATIONAL<br>PARK<br>LAND                             | Lassen Volcanic                                           | 103             | 51                         | 3                                  | 77,768            | 80                   | \$ 9.13                                               |         |
|                                                      | Yosemite                                                  | 1,235           | 275                        | 32                                 | 11,697            |                      |                                                       |         |
|                                                      | Sequoia-Kings Canyon*                                     |                 |                            |                                    |                   |                      |                                                       |         |
| ALL WORK DONE<br>BY THE<br>NATIONAL PARK SERVICE     |                                                           | Initial         | 40                         | 35                                 | 1                 | 89,465               | 80                                                    | \$ 9.13 |
|                                                      |                                                           | Reeradication   | 582                        | 184                                | 28                |                      |                                                       |         |
|                                                      |                                                           | Maintenance     | 716                        | 107                                | 6                 |                      |                                                       |         |
|                                                      |                                                           | All             | 1,338                      | 326                                | 35                |                      |                                                       |         |
| ALL WORK DONE IN CALIFORNIA                          |                                                           |                 |                            |                                    |                   |                      |                                                       |         |
| ALL OWNERSHIPS<br>ALL AGENCIES                       |                                                           | Initial         | 4,292                      | 3,054                              | 488               | 182,105              | 16,658                                                | \$ 7.24 |
|                                                      |                                                           | Reeradication   | 15,669                     | 4,340                              | 932               |                      |                                                       |         |
|                                                      |                                                           | Maintenance     | 2,664                      | 262                                | 23                |                      |                                                       |         |
|                                                      |                                                           | All             | 22,625                     | 7,656                              | 1,443             |                      |                                                       |         |

\*Inactive control units.







